SECTION 07550
MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Torch Applied 2-Ply Asphalt Roofing (StressPly IV). (2.15)(3.8)
   1. SCOPE OF WORK:
      A. Remove existing roof assembly down to structural concrete deck(existing assembly consists of concrete deck, tapered polyisocyanurate insulation, ballasted EPDM membrane-Well #9. Existing assembly consists of concrete deck, tapered polyisocyanurate insulation, adhered EPDM membrane-Pump#8).
      B. Prime concrete deck with Garlaprime asphalt roof primer at a rate of .5 gallons/square.
      C. Install 1xPly HPR Torch base sheet as a vapor retarder directly to the primed concrete deck.
      D. Install ¼:12 tapered polyisocyanurate insulation with a minimum of 1" thickness at drains on entire roof in insulation adhesive according to wind uplift calculations. Average R-value for assembly is 25.
      E. Install .5" Densdeck in insulation adhesive according to wind uplift calculations directly to tapered polyisocyanurate insulation.
      F. Install 1xPly HPR Torch Base sheet directly to Densdeck.
      G. Install 1xPly Stressply IV Mineral directly to torch base sheet.
      H. Coat entire roof with Garlabrite roof coating at a rate of 2.0 gallons/square.
      I. Install 1xPly HPR Torch Base Sheet and 1xPly Stressply IV Mineral cap sheet at all penetrations and perimeter.
      J. Install new Kynar-coated 24-ga. Steel sheet metal flashing and trim in accordance with Section 07 60 00 and drawings/details in color selected by owner.
      K. Clean up and haul away all debris.

B. Accessories. (2.16)

C. Edge Treatment and Roof Penetration Flashings. (2.17)(3.9)

1.2 RELATED SECTIONS

A. Section 07220 - Roof Deck Substrate Preparation.

B. Section 06100 - Rough Carpentry.

C. Section 06114 - Wood Blocking and Curbing: Wood nailers and cant strips.

D. Section 07220 - Insulation Board: Insulation and fastening.

E. Section 07620 - Sheet Metal Flashing and Trim: Weather protection for base flashings.

F. Section 07710 - Manufactured Roof Specialties: Counter flashing gravel stops, and fascia.

G. Section 08620 - Unit Skylights: Skylight frame and integral curb and counter flashing.

H. Section 08630 - Metal-Framed Skylights: Skylight frame and integral curb and counter flashing.

I. Section 15120 - Piping Specialties: Roof Drains, Sumps.

1.3 REFERENCES

A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.

C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.

D. ASTM D 1970 - Specification for Sheet Materials, Self-Adhering Polymer Modified Bituminous, Used as Steep Roofing Underlayment for Ice Dam Protection.

E. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.

F. ASTM D 1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.

G. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.

H. ASTM D 2178 Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.

I. ASTM D 2822 Standard Specification for Asphalt Roof Cement.

J. ASTM D 2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.

K. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.

L. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.

M. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.

N. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.

O. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

P. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.

Q. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings

R. Factory Mutual Research (FM): Roof Assembly Classifications.

S. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

T. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.

U. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.

V. Warnock Hersey (WH): Fire Hazard Classifications.

W. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.

X. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures

Y. UL - Fire Resistance Directory.

Z. FM Approvals - Roof Coverings and/or RoofNav assembly database.

AA. FBC - Florida Building Code.

BB. Miami-Dade Building Code Compliance - N.O.A. (Notice of Acceptance).

CC. California Title 24 Energy Efficient Standards.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Perform work in accordance with all federal, state and local codes.

B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
1. Factory Mutual Class A Rating.
2. Underwriters Laboratory Class A Rating.
3. Warnock Hersey Class A Rating.

C. Design Requirements:
1. Uniform Wind Uplift Load Capacity
a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
1) Design Code: ASCE 7-05, Method 2 for Components and Cladding.
2) Importance Category:
a) I.
b) II.
c) III.
d) IV
3) Importance Factor of:
a) 0.77
b) 1.0
c) 1.15
d) 2.0
4) Wind Speed: ___ mph
5) Ultimate Pullout Value: ___ pounds per each of the fastener
6) Exposure Category:
a) B.
b) C.
c) D.
7) Design Roof Height: ___ feet.
8) Minimum Building Width: ___ feet.
9) Roof Pitch: ___ :12.
10) Roof Area Design Uplift Pressure:
a) Zone 1 - Field of roof ___ psf
b) Zone 2 - Eaves, ridges, hips and rakes ___ psf
c) Zone 3 - Corners ___ psf
2. Snow Load: ___ psf.
3. Live Load: 20 psf, or not to exceed original building design.

4. Dead Load:
    a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

D. Energy Star: Roof System shall comply with the initial and aged reflectivity required by the U.S. Federal Government's Energy Star program.

E. LEED: Roof system shall meet the reflectivity and emissivity criteria to qualify for one point under the LEED credit category, Credit 7.2, Landscape & Exterior Design to Reduce Heat Island - Roof.

F. Roof System membranes containing recycled or bio-based materials shall be third party certified through UL Environment.

G. Roof system shall have been tested in compliance with the following codes and test requirements:
1. Warnock Hersey
    a. ITS Directory of Listed Products
2. FM Approvals:
    a. RoofNav Website

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation instructions.

C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.

D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7-05 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins. Report shall be signed and sealed by a Professional Engineer registered in the State of the Project who has provided roof system attachment analysis for not less than 5 consecutive years.

E. LEED Submittals: Provide documentation of how the requirements of Credit will be met:
1. List of proposed materials with recycled content. Indicate post-consumer recycled content and pre-consumer recycled content for each product having recycled content.
2. Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content.
3. Product reflectivity and emissivity criteria to qualify for one point under the LEED credit category, Credit 7.2, Landscape & Exterior Design to Reduce Heat Island - Roof.

F. Recycled or Bio-Based Materials: Provide third party certification through UL Environment of roof System membranes containing recycled or bio based materials

G. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

H. Manufacturer's Certificates: Provide to certify products meet or exceed specified

requirements.

I. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.

J. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwritters Laboratories (UL), Warnock Hersey (WH) or approved thirs party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

K. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.

D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.

E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.

F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.7 PRE-INSTALLATION MEETINGS

A. Convene minimum two weeks prior to commencing Work of this section.

B. Review installation procedures and coordination required with related Work.

C. Inspect and make notes of job conditions prior to installation:
   1. Record minutes of the conference and provide copies to all parties present.
   2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
   3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.

B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.

C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface. No wet or damaged materials will be used in the application.

D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.

E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

F. Adhesive storage shall be between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.9 COORDINATION

A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 WARRANTY

A. Upon completion of the work, provide the Manufacturer's written and signed NDL Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installing contractor, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition.
   1. Warranty Period:
      a. 15 + 15 years from date of acceptance. Requires mid period inspection.

B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
   1. Warranty Period:
      a. 2 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Garland Company, Inc. (The), which is located at: 3800 E. 91st St.; Cleveland, OH 44105; Toll Free Tel: 800-321-9336; Tel: 216-641-7500; Fax: 216-641-0633; Email:request info (blambert@garlandind.com); Web:www.garlandco.com

B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Base (Ply) Sheet:
   1. HPR Torch Base:

B. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with interplay adhesive.
   1. StressPly IV Mineral:

C. Interply Adhesive:
   1. NA

D. Flashing Base Ply:
   1. HPR Torch Base:

E. Flashing Cap (Ply) Sheet
   1. StressPly IV Mineral:

F. Flashing Ply Adhesive:
   1. None for torch sheets only.

G. Surfacing:
   1. Surface Coatings
      a. Garla-Brite:

2.3 ACCESSORIES:

A. Roof Insulation: In accordance with Section 07220.

B. Vapor Retarder: HPR Torchbase SBS modified, torch applied sheet material. ASTM D 6163, Type II. Install one torch ply sheet using a suitable heat source adhere one ply to the entire surface. Shingle in direction of slope of roof to shed water on each roof area.
   1. Tensile Strength, ASTM D 5147
      a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
      b. 50 mm/min. @ 23 +/- 2 deg. C MD 210 lbf/in XD 210 lbf/in
   2. Tear Strength, ASTM D 5147
      a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf XD 1112 N
      b. 50 mm/min. @ 23 +/- 2 deg. C MD 250 lbf XD 1112 N
   3. Elongation at Maximum Tensile, ASTM D 5147
      a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.0 % XD 4.0 %
      b. 50 mm/min@ 23 +/- 2 deg. C MD 4.0 % XD 4.0 %
   4. Low Temperature Flexibility, ASTM D 5147: Passes -35 deg. F (-37 deg. C)

C. Pitch Pocket Sealer - Seal-Tite: Two part, 100% solids, self-leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.
   1. Durometer, ASTM D 2240: 40-50 Shore
   2. Elongation, ASTM D 412: 250%
   3. Tensile Strength, ASTM D 412: 200 @ 100 mil

2.4 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

A. Manufactured Flashing Ply: R-MER Ply galvalume steel and modified membrane roof termination/flashing system comprised of a flexible, tie-in membrane, factory-bonded within a watertight, mechanical seal to a galvalume steel vertical flashing or fascia reveal profile. Siliconized modified polyester, epoxy primer baked both sides. Modified membrane is a 180 mil, Styrene-Butadiene-Styrene SBS (Styrene-Butadiene-Styrene) rubber modified membrane reinforced with a dual fiberglass scrim.
   1. Tensile Strength, ASTM D 5, 147
      a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in CMD 210 lbf/in

b. 50 mm/min. @ 23 +/- 3 deg. C MD 36.75 kN/m CMD 36.75 kN/m

2. Tear Strength, ASTM D 5147
   a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf CMD 250 lbf
   b. 50 mm/min. @ 23 +/- 3 deg. C MD 1112 N CMD 1112 N
3. Elongation at Maximum Tensile, ASTM D5147
   a. 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6.0% CMD 6.0%
   b. 50 mm/min. @ 23 +/- 3 deg. C MD 6.0% CMD 6.0%
4. Low Temperature Flexibility, ASTM D5147: Passes -30 deg. F (-34 deg. C)
5. Coating Properties:
   a. PencilHardness, NCCA II-2 - ASTM D3363, F-H
   b. Bend, NCCA II-19, ASTM D 4145, 2-T
   c. Adhesion / Cross-Hatch, ASTM D3359, no loss of adhesion
   d. Gloss (60 deg. angle), ASTM D 523, 90 +/- 5%
   e. Reverse Impact, ASTM D 2794no cracking or loss of adhesion
   f. Nominal Thickness, ASTM D 1005, primer and topcoat 1.0 mils.

B. Flashing Boot - Rubbertite Flashing Boot: Neoprene pipe boot for sealing single or multiple pipe penetrations adhered in approved adhesives as recommended and furnished by the membrane manufacturer.

C. Vents and Breathers: Heavy gauge aluminum and fully insulated vent that allows moisture and air to escape but not enter the roof system as recommended and furnished by the membrane manufacturer.

D. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be welded/soldered watertight. See details for design.

E. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.

F. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.

G. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
   1. Tensile Strength, ASTM D 412: 400 psi
   2. Elongation, ASTM D 412: 300%
   3. Density @77 deg. F 8.5 lb/gal typical

H. Fabricated Flashings: Fabricated flashings and trim are specified in Section 07620.
   1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.

I. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07710.
   1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and

elements.

C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.

D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. General: Clean surfaces thoroughly prior to installation.
   1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
   2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
   3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
   4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
   5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
   6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
   7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

B. Precast concrete:
   1. Decks shall be clean, dry, fully cured and free of flaws and attached securely to the supporting structure as recommended by the deck manufacturer.
   2. All joints shall be caulked or grouted.
   3. Concrete surfaces to receive roofing shall be fully primed at the rate of 1 gallon per 100 sq. ft.
   4. When applying roofing or insulation directly to the deck with asphalt, prime with asphalt/concrete primer, ASTM D41, at a rate of 1 gal/square (.4 L/m2) and allow the primer to dry prior to the application of the roofing system. Hold back bitumen at the joints approximately 4 inches (102 mm) to prevent bitumen drippage.
   5. Deck joints shall be stripped in with a 12 inch (305 mm) wide strip of modified membrane unadhered a minimum of 2 inches (51 mm) immediately on either side of the joint.

C. Torch Applied Vapor Barrier: Install one torch on fiberglass base sheet using a suitable heat source adhere one ply to the entire surface. Shingle in direction of slope of roof to shed water on each area of roof

D. Fiberglass Vapor Barrier Plies: Install two fiberglass ply sheets in 25 lbs. per square (11.3kg) of ASTM D 312 Type III bitumen shingled uniformly to achieve two plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof.

E. Insulation: Roof insulation is specified in Section
   1. All joints between layers should be staggered when multiple layers of insulation are installed. Insulation greater than 2.5 inches shall be installed in multiple layers.
   2. Insulation shall be kept dry at all times. Install only as much insulation as can be covered with completed roofing membrane before the end of the day's work or prior to onset of inclement weather.
   3. Edges shall butt tightly and all cuts shall fit neatly against adjoining surfaces to provide a smooth overall surface. Gaps of greater than 1/4 inch width shall be filled

with insulation.

4. Install tapered insulation around roof drains and penetrations to provide adequate slope for proper drainage.
5. Mechanically attached insulation shall be fastened in accordance with code and insurance requirements for the applicable geographic zone with the required number and type of fasteners and plates.
6. When asphalt or cold adhesive attachment is specified, the proposed insulation shall be compatible with the roof substrate, the proposed bitumen and the requirements of the specific membrane.
7. Hot asphalt application:
   a. Maximum 4 foot by 4 foot insulation boards shall be attached with hot asphalt.
   b. Asphalt for insulation attachment shall meet ASTM D 312 Type III or IV criteria, as dictated by the roof slope or other design conditions.
   c. Expanded polystyrene (EPS) materials shall not be installed with hot bitumen products.

3.3 INSTALLATION - GENERAL

A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.

B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
   1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
   2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.

C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water

D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION TORCH APPLIED 2-PLY ASPHALT ROOFING

A. Base Ply: Install torch base sheet to a properly prepared substrate. Shingle in proper direction to shed water on each area of roofing.
   1. Lay out the roll in the course to be followed and unroll 6 feet (1.8 m).
   2. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
   3. After the major portion of the roll is bonded, re-roll the first 6 feet (1.8 m) and bond it in

a similar fashion.

4. Repeat this operation with subsequent rolls with side laps of 4 inches (101 mm) and end laps of 8 inches (203 mm).
5. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.
6. Extend underlayment 2 inches (50 mm) beyond top edges of cants at wall and projection bases.
7. Install base flashing ply to all perimeter and projections details.

B. Modified Cap (Ply) Sheet: Over torch base sheet underlayment, lay out the roll in the course to be followed and unroll 6 feet (1.8 m). Stagger seams over the torch base sheet seams.

1. Using a roofing torch, heat the surface of the coiled portion until the burn-off backer melts away. At this point, the material is hot enough to lay into the substrate. Progressively unroll the sheet while heating and press down with your foot to insure a proper bond.
2. After the major portion of the roll is bonded, re-roll the first 6 feet (1.8 m) and bond it in a similar fashion.
3. Repeat this operation with subsequent rolls with side laps of 4 inches (101 mm) and end laps of 8 inches (203 mm).
4. Give each lap a finishing touch by passing the torch along the joint and spreading the melted bitumen evenly with a rounded trowel to insure a smooth, tight seal.

C. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.

D. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.

1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

E. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.

F. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.

G. Flashing Base Ply: Seal all curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.

1. Prepare all walls, penetrations, expansion joints, and other surfaces to be flashed with asphalt primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
2. Adhere modified flashing base to the underlying base flashing ply with specified flashing ply adhesive. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
3. Solidly adhere the entire sheet of flashing membrane to the substrate. Tops of all

flashings that are not run up and over curb shall be secured through termination bar 6 inches (152 mm) and sealed at top

4. Seal all vertical laps of flashing membrane with a three-course application of trowel-grade mastic and fiberglass mesh.
5. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work.
6. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work. When using mineralized cap sheet all stripping plies type IV felt / Versiply 40 shall be installed prior to cap sheet installation.

H. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.

1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

I. Roof Walkways: Provide walkways in areas indicated on the Drawings.

3.5 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Metal Edge:

1. Inspect the nailers to assure proper attachment and configuration.
2. Run one ply over the edge. Assure coverage of all wood nailers. Fasten plies with ring shank nails at 8 inches (203 mm) o.c.
3. Install continuous cleat and fasten at 6 inches (152 mm) o.c.
4. Install new metal edge hooked to continuous cleat and set in bed of roof cement. Fasten flange to wood nailers every 3 inches (76 mm) o.c. staggered.
5. Prime metal edge at a rate of 100 square feet per gallon and allow to dry.
6. Strip in flange with base flashing ply covering entire flange in bitumen with 6 inches (152 mm) on to the field of roof. Assure ply laps do not coincide with metal laps.
7. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Seal outside edge with rubberized cement.

B. Coping Cap:

1. Minimum flashing height is 8 inches (203 mm) above finished roof height. Maximum flashing height is 24 inches (609 mm). Prime vertical wall at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Attach tapered board to top of wall.
4. Install base flashing ply covering entire wall and wrapped over top of wall and down

face with 6 inches (152 mm) on to field of roof and set in cold asphalt. Nail membrane at 8 inches (203 mm) o.c.

5. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all seams and allow to cure and aluminize.
6. Install continuous cleat and fasten at 6 inches (152 mm) o.c. to outside wall.
7. Install new metal coping cap hooked to continuous cleat.
8. Fasten inside cap 24 inches (609 mm) o.c. with approved fasteners and neoprene washers through slotted holes, which allow for expansion and contraction.

C. Equipment Support:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.

D. Skylight:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of wood nailer and apply a three-course application of mastic and mesh. Allow to cure and aluminize.
5. Install pre-manufactured lens and fasten flashing sides at 8 inches (203 mm) o.c. with fasteners and neoprene washers.

E. Exhaust Fan:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches (228 mm) on to field of the roof. Attach top of membrane to top of wood curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

F. Roof Drain:
1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation to drain minimum of 24 inches (609 mm) from center of drain.
3. Run roof system plies over drain. Cut out plies inside drain bowl.
4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch bed of mastic. Run lead/copper into drain a minimum of 2 inches (50 mm). Prime lead/copper at a rate of

100 square feet per gallon and allow to dry.
5. Install base flashing ply (40 inch square minimum) in bitumen.
6. Install modified membrane (48 inch square minimum) in bitumen.
7. Install clamping ring and assure that all plies are under the clamping ring.
8. Remove drain plug and install strainer.

G. Plumbing Stack:
1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1 inch (25 mm) down inside of stack.

H. Pitch Pocket:
1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one ply of base flashing ply. Extend 6 inches (152 mm) onto field of roof.
4. Install second layer of modified membrane extending 9 inches (228 mm) onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

I. Liquid Flashing:
1. Mask target area on roof membrane with tape.
2. Clean all non-porous areas with isopropyl alcohol.
3. Apply 32 wet mil base coat of liquid flashing over masked area.
4. Embed polyester reinforcement fabric into the base coat of the liquid flashing.
5. Apply 48-64 wet mil top coat of the liquid flashing material over the fabric extending 2 inches (51 mm) past the scrim in all directions.
6. Apply minerals immediately or allow the liquid flashing material to cure 15-30 days and then install reflective coating.

3.6 PROTECTION

A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.

B. Protect exposed surfaces of finished walls with tarps to prevent damage.

C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.

D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.

E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

A. Inspection: Provide manufacturer's field observations at start-up and at intervals of

approximately 30 percent, 60 percent and 90 percent completion. Provide a final inspection upon completion of the Work.

1. Warranty shall be issued upon manufacturer's acceptance of the installation.
2. Field observations shall be performed by a Technical Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve membrane installations for the manufacturer.
3. Provide observation reports from the Technical Representative indicating procedures followed, weather conditions and any discrepancies found during inspection.
4. Provide a final report from the Technical Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 SCHEDULES

A. Base (Ply) Sheet:
   1. HPR Torch Base: 110 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed.
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 36.75 kN/m XD 36.75 kN/m
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf XD 250 lbf
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 1112N XD 1112N
      c. Elongation at Maximum Tensile, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.0% XD 4.0%
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 4.0% XD 4.0%
      d. Low Temperature Flexibility, ASTM D5147, Passes -35 deg. F (-37 deg. C)

B. Modified Cap (Ply) Sheet:
   1. StressPly IV Mineral: 195 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane with a dual fiberglass scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed.
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 36.75 kN/m XD 36.75 kN/m
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf XD 250 lbf
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 1112 N XD 1112 N
      c. Elongation at Maximum Tensile, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6% XD 6%
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 6% XD 6%
      d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34 deg. C)

C. Flashing Base Ply:
   1. HPR Torchbase: SBS modified, torch applied sheet material. ASTM D 6163, Type II.
      a. Tensile Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 210 lbf/in XD 210 lbf/in
      b. Tear Strength, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf XD 1112 N
         2) 50 mm/min. @ 23 +/- 2 deg. C MD 250 lbf XD 1112 N
      c. Elongation at Maximum Tensile, ASTM D 5147
         1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.0 % XD 4.0 %
         2) 50 mm/min@ 23 +/- 2 deg. C MD 4.0 % XD 4.0 %

d. Low Temperature Flexibility, ASTM D 5147: Passes -35 deg. F (-37 deg. C). Meets or Exceeds ASTM D 4601 Type II Performance Criteria.

D. Surfacing:
1. Flashing Cap (Ply) Sheet:
a. StressPly IV Mineral: 195 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced rubber modified roofing membrane with a dual fiberglass scrim. Designed for torch applications with a burn-off backer that indicates when the material is hot enough to be installed.
1) Tensile Strength, ASTM D 5147
a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 210 lbf/in XD 210 lbf/in
b) 50 mm/min. @ 23 +/- 2 deg. C MD 36.75 kN/m XD 36.75 kN/m
2) Tear Strength, ASTM D 5147
a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 250 lbf XD 250 lbf
b) 50 mm/min. @ 23 +/- 2 deg. C MD 1112 N XD 1112 N
3) Elongation at Maximum Tensile, ASTM D 5147
a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 6% XD 6%
b) 50 mm/min. @ 23 +/- 2 deg. C MD 6% XD 6%
4) Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34 deg. C)
2. Surface Coatings:
a. Surfacing:
1) Garla-Brite: ASTM D 2824 aluminum coating non-fibered aluminum roof coating non-fibered aluminum roof coating having the following characteristics:
a) Flash Point 103 deg. F (39 deg. C) min.
b) Weight/Gallon 7.9 lbs./gal. (1.0 g/cm3)

END OF SECTION